

CLAIMS

What is claimed is:

1 1. A fiber optic module for coupling photons between
2 optoelectronic devices and optical fibers, the fiber optic
3 module comprising:
4 a base;
5 a back plane including a horizontal and vertical array of
6 edge connectors and a connector to couple to a host system;
7 a horizontal and vertical array of printed circuit boards
8 each having an edge connector and an optoelectronic device
9 coupled thereto in parallel to the optical axis of the
10 optoelectronic device, the horizontal and vertical array of
11 printed circuit boards each having its respective edge
12 connector coupled to the respective horizontal and vertical
13 array of edge connectors of the back plane; and
14 a shielded housing coupled to the base to encase the
15 plurality of printed circuit boards to reduce electromagnetic
16 interference (EMI).

1 2. The fiber optic module of claim 1 further comprising:
2 an optical block coupled to each of the optoelectronic
3 devices of the horizontal and vertical array of printed
4 circuit boards, the optical block having
5 a horizontal and vertical array of openings to receive
6 each of the optoelectronic devices of the horizontal and
7 vertical array of printed circuit boards, and
8 a horizontal and vertical array of lenses to couple
9 photons between each of the optoelectronic devices of the
10 horizontal and vertical array of printed circuit boards and a
11 plurality of optical fibers respectively.

1 3. The fiber optic module of claim 2 further comprising:
2 a nose to receive an optical fiber connector and to hold
3 the plurality of optical fibers substantially fixed and
4 aligned with the horizontal and vertical array of openings of
5 the optical block.

1 4. The fiber optic module of claim 3 further comprising:
2 a nose shield surrounding the nose to reduce
3 electromagnetic interference.

1 5. The fiber optic module of claim 1 wherein,
2 the back plane includes traces between the horizontal and
3 vertical array of edge connectors and the host connector.

1 6. The fiber optic module of claim 1 wherein,
2 the connector is a plurality of pins.

1 7. The fiber optic module of claim 1 wherein,
2 the connector is an electrical connector including a
3 plurality of pins.

1 8. The fiber optic module of claim 1 wherein,
2 the horizontal and vertical array of printed circuit
3 boards is a horizontal and vertical array of vertical printed
4 circuit boards.

1 9. The fiber optic module of claim 8 wherein,
2 the horizontal and vertical array of vertical printed
3 circuit boards are each arranged perpendicular to the base and
4 parallel to each other to form a horizontal and vertical array
5 of fiber optical channels.

1 10. The fiber optic module of claim 1 wherein,
2 the horizontal and vertical array of printed circuit
3 boards is a horizontal and vertical array of horizontal
4 printed circuit boards.

1 11. The fiber optic module of claim 10 wherein,
2 the horizontal and vertical array of horizontal printed
3 circuit boards are each arranged parallel to the base and to
4 each other to form a horizontal and vertical array of fiber
5 optical channels.

1 12. The fiber optic module of claim 1 wherein,
2 the horizontal and vertical array of printed circuit
3 boards is a horizontal and vertical array of slanted printed
4 circuit boards.

1 13. The fiber optic module of claim 12 wherein,
2 the horizontal and vertical array of slanted printed
3 circuit boards are each arranged parallel to each other to
4 form a horizontal and vertical array of fiber optical
5 channels.

1 14. The fiber optic module of claim 1 wherein,
2 the horizontal and vertical array of printed circuit
3 boards is a combination of of slanted printed circuit boards
4 and vertical printed circuit boards.

1 15. The fiber optic module of claim 1 wherein,
2 the horizontal and vertical array of printed circuit
3 boards is a combination of of slanted printed circuit boards
4 and horizontal printed circuit boards.

1 16. The fiber optic module of claim 1 wherein,
2 the horizontal and vertical array of printed circuit
3 boards is a combination of of vertical printed circuit boards
4 and horizontal printed circuit boards.

1 17. The fiber optic module of claim 1 wherein,
2 the horizontal and vertical array of printed circuit
3 boards is a combination of of vertical printed circuit boards,
4 horizontal printed circuit boards and slanted printed circuit
5 boards.

1 18. The fiber optic module of claim 1 wherein,
2 each of the printed circuit boards includes a ground
3 plane on one side.

1 19. The fiber optic module of claim 1 wherein,
2 the connector is a plurality of pins to couple to the
3 host system.

1 20. The fiber optic module of claim 1 wherein,
2 the connector is an electrical connector to plug into an
3 electrical connector of the host system to connect thereto.

1 21 The fiber optic module of claim 1 wherein,
2 some optoelectronic devices of the horizontal and
3 vertical array of printed circuit boards are coupled thereto
4 using a through hole mount configuration; and
5 other optoelectronic devices of the horizontal and
6 vertical array of printed circuit boards are coupled thereto
7 using a straddle mount configuration.

1 22. A fiber optic module for coupling photons between
2 optoelectronic devices and optical fibers, the fiber optic
3 module comprising:
4 a base;
5 a back plane including a horizontal and vertical array of
6 edge connectors and a host connector to couple to a host
7 system;
8 a horizontal and vertical array of vertical printed
9 circuit boards each having an edge connector and an
10 optoelectronic device coupled thereto in parallel to the
11 optical axis of the optoelectronic device, the horizontal and
12 vertical array of vertical printed circuit boards each having
13 its respective edge connector coupled to the respective edge
14 connector of the back plane; and
15 a cover coupled to the base to protect the horizontal and
16 vertical array of vertical printed circuit boards.

1 23. The fiber optic module of claim 22 further
2 comprising:
3 an optical block coupled to each of the optoelectronic
4 devices of the horizontal and vertical array of vertical
5 printed circuit boards, the optical block having
6 a horizontal and vertical array of openings to receive
7 each of the optoelectronic devices of the horizontal and
8 vertical array of vertical printed circuit boards, and
9 a horizontal and vertical array of lenses to couple
10 photons between each of the optoelectronic devices of the
11 horizontal and vertical array of vertical printed circuit
12 boards and a plurality of optical fibers respectively.

1 24. The fiber optic module of claim 23 further
2 comprising:

3 a nose to receive an optical fiber connector and to hold
4 the plurality of optical fibers substantially fixed and
5 aligned with the horizontal and vertical array of openings of
6 the optical block.

1 25. The fiber optic module of claim 24 further
2 comprising:

3 a nose shield surrounding the nose to reduce
4 electromagnetic interference.

1 26. The fiber optic module of claim 22 wherein,
2 the back plane includes traces between the horizontal and
3 vertical array of edge connectors and the host connector.

1 27. The fiber optic module of claim 22 wherein,
2 the host connector is a plurality of pins.

1 28. The fiber optic module of claim 22 wherein,
2 the host connector is an electrical connector including a
3 plurality of pins.

1 29. The fiber optic module of claim 22 further
2 comprising:

3 a horizontal and vertical array of optical blocks coupled
4 to each of the optoelectronic devices of the horizontal and
5 vertical array of vertical printed circuit boards, the
6 horizontal and vertical array of optical blocks having
7 a horizontal and vertical array of openings to receive
8 each of the optoelectronic devices of the horizontal and
9 vertical array of vertical printed circuit boards, and
10 a horizontal and vertical array of lenses to couple
11 photons between each of the optoelectronic devices of the

12 horizontal and vertical array of vertical printed circuit
13 boards and a plurality of optical fibers respectively.

1 30. The fiber optic module of claim 29 further
2 comprising:

3 a nose to receive an optical fiber connector and to hold
4 the plurality of optical fibers substantially fixed and
5 aligned with the horizontal and vertical array of openings of
6 the optical block.

1 31. The fiber optic module of claim 30 further
2 comprising:

3 a nose shield surrounding the nose to reduce
4 electromagnetic interference.

1 32. The fiber optic module of claim 22 wherein,
2 the cover is a shielded cover which is conductive.

1 33. The fiber optic module of claim 22 wherein,
2 each of the vertical printed circuit boards includes a
3 ground plane on one side.

1 34. The fiber optic module of claim 22 wherein,
2 each optoelectronic device of the horizontal and vertical
3 array of vertical printed circuit boards is coupled thereto
4 using a straddle mount configuration.

1 35. The fiber optic module of claim 22 wherein,
2 each optoelectronic device of the horizontal and vertical
3 array of vertical printed circuit boards is coupled thereto
4 using a through hole mount configuration.

1 36. The fiber optic module of claim 22 wherein,
2 some optoelectronic devices of the horizontal and
3 vertical array of vertical printed circuit boards are coupled
4 thereto using a through hole mount configuration; and
5 other optoelectronic devices of the horizontal and
6 vertical array of vertical printed circuit boards are coupled
7 thereto using a straddle mount configuration.

1 37. The fiber optic module of claim 22 wherein,
2 each of the plurality of vertical printed circuit boards
3 is perpendicular to the base to form a horizontal and
4 vertical array of fiber optic channels.

1 38. A fiber optic module for coupling photons between
2 optoelectronic devices and optical fibers, the fiber optic
3 module comprising:
4 a base;
5 a back plane including a horizontal and vertical array of
6 edge connectors and a host connector to couple to a host
7 system;
8 a horizontal and vertical array of horizontal printed
9 circuit boards each having an edge connector and an
10 optoelectronic device coupled thereto in parallel to the
11 optical axis of the optoelectronic device, the horizontal and
12 vertical array of horizontal printed circuit boards each
13 having its respective edge connector coupled to the horizontal
14 and vertical array of edge connectors of the back plane
15 respectively; and
16 a housing coupled to the base to protect the horizontal
17 and vertical array of horizontal printed circuit boards.

1 39. The fiber optic module of claim 38 further
2 comprising:

3 an optical block coupled to each of the optoelectronic
4 devices of the horizontal and vertical array of horizontal
5 printed circuit boards, the optical block having

6 a plurality of openings to receive each of the
7 optoelectronic devices of the horizontal and vertical array of
8 horizontal printed circuit boards, and

9 a plurality of lenses to couple photons between each of
10 the optoelectronic devices of the horizontal and vertical
11 array of horizontal printed circuit boards and a plurality of
12 optical fibers respectively.

1 40. The fiber optic module of claim 39 further
2 comprising:

3 a nose to receive an optical fiber connector and to hold
4 the plurality of optical fibers substantially fixed and
5 aligned with the horizontal and vertical array of openings of
6 the optical block.

1 41. The fiber optic module of claim 40 further
2 comprising:

3 a nose shield surrounding the nose to reduce
4 electromagnetic interference.

1 42. The fiber optic module of claim 38 wherein,
2 the back plane includes traces between the horizontal and
3 vertical array of edge connectors and the host connector.

1 43. The fiber optic module of claim 38 wherein,
2 the host connector is a plurality of pins.

1 44. The fiber optic module of claim 38 wherein,
2 the host connector is an electrical connector including a
3 plurality of pins.

1 45. The fiber optic module of claim 38 further
2 comprising:
3 an array of optical blocks coupled to each of the
4 optoelectronic devices of the horizontal and vertical array of
5 horizontal printed circuit boards, the array of optical blocks
6 having
7 an array of openings to receive each of the
8 optoelectronic devices of the horizontal and vertical array of
9 horizontal printed circuit boards, and
10 an array of lenses to couple photons between each of the
11 optoelectronic devices of the horizontal and vertical array of
12 horizontal printed circuit boards and a plurality of optical
13 fibers respectively.

1 46. The fiber optic module of claim 45 further
2 comprising:
3 a nose to receive an optical fiber connector and to hold
4 the plurality of optical fibers substantially fixed and
5 aligned with the array of openings of the array of optical
6 blocks.

1 47. The fiber optic module of claim 46 further
2 comprising:
3 a nose shield surrounding the nose to reduce
4 electromagnetic interference.

1 48. The fiber optic module of claim 38 wherein,

2 the housing is a shielded housing which is conductive.

1 49. The fiber optic module of claim 38 wherein,
2 each of the horizontal and vertical array of horizontal
3 printed circuit boards includes a ground plane on one side.

1 50. The fiber optic module of claim 38 wherein,
2 each of the edge connectors of the horizontal and
3 vertical array of horizontal printed circuit boards includes
4 one or more staggered pads to plug in the printed circuit
5 board when the hot.

1 51. A fiber optic module for coupling photons between
2 optoelectronic devices and optical fibers, the fiber optic
3 module comprising:
4 a base;
5 a back plane including a plurality of edge connectors and
6 a host connector to couple to a host system;
7 a horizontal and vertical array of printed circuit boards
8 each having an edge connector and an optoelectronic device
9 coupled thereto in parallel to the optical axis of the
10 optoelectronic device, each of the respective edge connectors
11 of the horizontal and vertical array of printed circuit boards
12 having staggered pads to couple to respective edge connectors
13 of the back plane when powered up; and
14 a housing coupled to the base to protect the horizontal
15 and vertical array of printed circuit boards.

1 52. The fiber optic module of claim 51 further
2 comprising:
3 an optical block coupled to each of the optoelectronic
4 devices of the horizontal and vertical array of printed

5 circuit boards, the optical block having
6 a horizontal and vertical array of openings to receive
7 each of the optoelectronic devices of the horizontal and
8 vertical array of printed circuit boards, and
9 a plurality of lenses to couple photons between each of
10 the optoelectronic devices of the horizontal and vertical
11 array of printed circuit boards and a plurality of optical
12 fibers respectively.

1 53. The fiber optic module of claim 52 further
2 comprising:

3 a nose to receive an optical fiber connector and to hold
4 the plurality of optical fibers substantially fixed and
5 aligned with the horizontal and vertical array of openings of
6 the optical block.

1 54. The fiber optic module of claim 53 further
2 comprising:

3 a nose shield surrounding the nose to reduce
4 electromagnetic interference.

1 55. The fiber optic module of claim 51 wherein,
2 the back plane includes traces between the horizontal and
3 vertical array of edge connectors and the host connector.

1 56. The fiber optic module of claim 51 wherein,
2 the host connector is a plurality of pins.

1 57. The fiber optic module of claim 51 wherein,
2 the host connector is an electrical connector including a
3 plurality of pins.

1 58. The fiber optic module of claim 51 wherein,
2 the horizontal and vertical array of printed circuit
3 boards is a horizontal and vertical array of vertical printed
4 circuit boards.

1 59. The fiber optic module of claim 58 wherein,
2 the horizontal and vertical array of printed circuit
3 boards are a plurality of vertical printed circuit boards each
4 arranged perpendicular to the base and parallel to each other
5 to form a horizontal and vertical array of fiber optical
6 channels.

1 60. The fiber optic module of claim 58 wherein,
2 the horizontal and vertical array of printed circuit
3 boards are a plurality of vertical printed circuit boards each
4 arranged perpendicular to the base to form a horizontal and
5 vertical array of fiber optical channels.

1 61. The fiber optic module of claim 51 wherein,
2 the horizontal and vertical array of printed circuit
3 boards is a horizontal and vertical array of horizontal
4 printed circuit boards.

1 62. The fiber optic module of claim 61 wherein,
2 the horizontal and vertical array of horizontal printed
3 circuit boards are each arranged parallel to the base to form
4 a horizontal and vertical array of fiber optical channels.

1 63. The fiber optic module of claim 61 wherein,
2 the horizontal and vertical array of horizontal printed
3 circuit boards are each arranged parallel to the base and to

4 each other to form a horizontal and vertical array of fiber
5 optical channels.

1 64. The fiber optic module of claim 61 wherein,
2 the horizontal and vertical array of printed circuit
3 boards is a horizontal and vertical array of slanted printed
4 circuit boards.

1 65. The fiber optic module of claim 64 wherein,
2 the horizontal and vertical array of slanted printed
3 circuit boards are each arranged parallel to each other to
4 form a horizontal and vertical array of fiber optical
5 channels.

1 66. The fiber optic module of claim 64 wherein,
2 the horizontal and vertical array of slanted printed
3 circuit boards are each arranged parallel to each other and on
4 the angle with the base to form a horizontal and vertical
5 array of fiber optical channels.

1 67. The fiber optic module of claim 51 wherein,
2 the horizontal and vertical array of printed circuit
3 boards is a combination of of slanted printed circuit boards
4 and vertical printed circuit boards.

1 68. The fiber optic module of claim 51 wherein,
2 the horizontal and vertical array of printed circuit
3 boards is a combination of of slanted printed circuit boards
4 and horizontal printed circuit boards.

1 69. The fiber optic module of claim 51 wherein,
2 the horizontal and vertical array of printed circuit

3 boards is a combination of of vertical printed circuit boards
4 and horizontal printed circuit boards.

1 70. The fiber optic module of claim 51 wherein,
2 the horizontal and vertical array of printed circuit
3 boards is a combination of of vertical printed circuit boards,
4 horizontal printed circuit boards and slanted printed circuit
5 boards.

1 71. The fiber optic module of claim 51 wherein,
2 each of the printed circuit boards includes a ground
3 plane on one side.

1 72. The fiber optic module of claim 51 wherein,
2 each of the edge connectors of the printed circuit boards
3 includes one or more staggered pads to plug in the printed
4 circuit board when the fiber optic module is hot.

1 73 The fiber optic module of claim 51 wherein,
2 some optoelectronic devices of the horizontal and
3 vertical array of printed circuit boards are coupled thereto
4 using a through hole mount configuration; and
5 other optoelectronic devices of the horizontal and
6 vertical array of printed circuit boards are coupled thereto
7 using a straddle mount configuration.